REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the present amendments and following discussion, is respectfully requested.

Claims 22, 24, 26-34, and 36-47 are pending in the present application. Claims 22, 24, 26-34, and 36-42 are amended. Claims 43-47 are newly added. Claims 23, 25, and 35 are canceled without prejudice or disclaimer. Support for the amendment to Claim 22 can be found in now-canceled Claims 23 and 35 and in the specification as published at least at paragraphs [0043], [0047], and [0093], for example. Support for the amendments to Claims 24, 26-34, 36-37, and 39-42 is self-evident. Support for the amendment to Claim 38 can be found in the specification as published at least at paragraphs [0043], [0047], and [0093], for example. Support for newly added Claims 43-44 can be found in original Claim 28. Support for newly added Claims 45-46 can be found in the specification as published at least at paragraph [0092], for example. Support for newly-added Claim 47 can be found in the specification as published at least at paragraph [0094], for example. Thus, no new matter is added.

The outstanding Office Action rejected Claims 25, 28 and 38 under 35 U.S.C. § 112, second paragraph, as indefinite; and rejected Claims 22-42 under 35 U.S.C. § 103(a) as unpatentable over Ress, Jr. et al. (U.S. Patent No. 6,190,133, herein "Ress") in view of Bedford (GB 2242848).

In response to the rejection of Claims 25, 28 and 38 under 35 U.S.C. § 112, second paragraph, as indefinite, Claim 25 is canceled without prejudice or disclaimer, and Claims 28 and 38 are amended to correct the noted informalities.

Applicants respectfully traverse the rejection of Claims 22-42 under 35 U.S.C. § 103(a) as unpatentable over Ress in view of Bedford.

Amended independent Claim 22, recites, in part:

> a blade resulting from an initial step of compression followed by a forging step which imparts a quasi-final shape to said blade ...
>
> wherein said core and said casing include a metallurgical bond between each other resulting from said compression step.

Amended independent Claim 38, recites, in part:

> a) compressing a core and a casing to make a semi-finished product containing said core and said casing, said core and said casing including a metallurgical bond between each other resulting from said compression...
>
> b) forging the semi-finished product containing said core and said casing which have been compressed together in the previous step a) to obtain a blank with a quasi-final shape of the blade.

Thus, the blade is manufactured from a **compression** step followed by a **forging** step. The core and casing include a metallurgical bond between each other resulting from the compression step. As discussed below, performing a compression step followed by a forging step causes a **structural difference** in the blade that leads to improved material structure and mechanical resistance properties in the blade.

Thermomechanical operations, such as forging, are characterized by technical parameters such as temperature of the work environment, speed of deformation, and quantity of deformation. These parameters affect the fiber structure (geometrical factor) and a rate of kneading (mechanical factor) of the material when the material is filled into a die cavity.

As results of the forging step, the micro dislocations and grain boundaries in the material are directed in a principal direction. This fiber structure provides improved mechanical properties in the material after the forging step than in the material in the initial state, i.e., before forging. One can compare the dislocation to folds of a carpet which can

disappear only while being evacuated towards the outside and which can advantageously be oriented in a specific direction to increase the rigidity of the carpet in that specific direction.

By optimizing the above-noted technical parameters, the material is able to support the constraints and stresses of operation of a turbomachine. As a result of the forging step, there is a correlation between the final shape of the part and the required mechanical characteristics.

A blade produced by compression alone does not have such a fiber structure as there is no orientation of dislocations and grain boundaries. A micrographic section followed by a chemical etch can be used to visualize the presence or absence of the fiber structure, which includes defects such as matter folds and the distribution of grain boundaries, which are directly conditioned by the local rate of kneading.

Accordingly, as a result of good control of displacements of matter during the forging step, it is possible to obtain a strongly kneaded bi-material blade that can be machined in a finishing step with a fiber structure in both the core and the casing (periphery) of the blade with improved mechanical properties.

Moreover, the deformation and stress induced by the two different processes successively implemented according to the invention (compression followed by a forging) results in completely different behavior of the material. For example, the tendency for cracks to initiate at grain boundaries, which exists for the forging, does not occur in compression, as compression tends to close crack initiation sites.

Turning now to the cited art, Ress describes an airfoil with a core (23) and a metallic structure (22a). However, Ress fails to describe a succession of compressing and forging steps and a blade that includes an aluminum based metal matrix. Instead, Ress describes a

cast metallic airfoil (22) with a core (23) made of a **titanium metal matrix**[1] that is surrounded by and coupled to a **cast metallic structure** (22a)[2] made of a **titanium alloy**.[3]

Furthermore Ress describes a metallurgical bond between the core (23) and the casing (22) resulting from **hot isostatic pressing (HIP)**.[4] In contrast, amended independent Claims 22 and 38 describe a metallurgical bond between the core and the casing resulting from **compression**. As discussed in detail above, the bond resulting from compression results in structural differences in the way the core and casing are bonded.

Bedford fails to remedy the deficiencies discussed above in Ress. Bedford merely describes a method for depositing a coating in a first material on the substrate of a second material by bringing a rotating body of the first material into contact with the surface of the second material. Bedford describes a coating made in an aluminum matrix composite containing silicon carbide on an aluminum substrate[5], but does not describe the proportion of silicon carbide in the coating. Furthermore, Bedford is silent regarding both a succession of compression and forging steps, and a blade.

Accordingly, no reasonable combination of Ress and Bedford would include all of the features recited in amended independent Claims 22 and 38, or claims depending therefrom. Therefore, Applicants respectfully request the rejection of Claims 22-42 under 35 U.S.C. § 103(a) be withdrawn.

Newly-added dependent Claims 43-43 each depend, directly or indirectly, from amended independent Claim 22, and patentably distinguish over the cited references for at least the same reasons that amended independent Claim 22 does. Newly-added dependent Claims 45-47 each depend, directly or indirectly, from amended independent Claim 38, and

[1] See Ress at column 4, lines 24-27.
[2] See Ress at column 3, lines 57-59.
[3] See Ress at column 4, lines 14-15.
[4] See Ress at column 6, lines 12-17.
[5] See Bedford at page 2, lines 12-16; page 4, lines 11-12; page 7, lines 6-8.

patentably distinguish over the cited references for at least the same reasons that amended independent Claim 38 does.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Philippe J.C. Signore, Ph.D.
Attorney of Record
Registration No. 43,922

Christopher A. Bullard
Registration No. 57,644

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)